

IN THE CLAIMS

- 1 1. (currently amended) An apparatus for determining a property of a fluid
2 downhole comprising:
3 (a) a resonator associated in contact with the fluid downhole;
4 (b) a controller ~~which~~ that actuates the resonator; and
5 (c) a processor ~~which~~ that estimates the property ~~for~~ of the fluid ~~downhole~~
6 using a response of the resonator to the actuation.
7
- 1 2. (previously presented) The apparatus of claim 1, wherein the processor uses a
2 chemometric equation for estimating the property.
3
- 1 3. canceled
2
- 1 4. (currently amended) The apparatus of ~~claim 1~~ claim 2 wherein the processor ~~uses~~
2 ~~a function for deriving a chemometric equation from~~ correlates a measured
3 resonator response ~~correlated~~ with known fluid property values.
4
- 1 5. (previously presented) The apparatus of claim 1, wherein the property is viscosity.
2
- 1 6. (previously presented) The apparatus of claim 1, wherein the property is density.
2

1 7. (previously presented) The apparatus of claim 1, wherein the property is dielectric
2 constant.

1 8. (previously presented) The apparatus of claim 1, wherein the property is
2 resistivity.

1 9. (previously presented) The apparatus of claim 2, wherein the processor applies
2 the chemometric estimated property to a Levenberg-Marquardt (LM) algorithm to
3 determine a fluid parameter value for the fluid.

1 10. (original) The downhole tool of claim 10, wherein the fluid parameter value
2 comprises a global minimum for the LM algorithm.

1 11. (currently amended) A method for determining a property of a fluid downhole
2 comprising:

3 (a) positioning a resonator adjacent to ~~interacting a~~ the downhole fluid with a
4 ~~resonator~~ ;

5 (b) actuating the resonator;

6 (c) measuring ~~receiving~~ a response from ~~of~~ the resonator to the actuation of
7 ~~the resonator~~; and

8 (d) estimating a value of the property of the fluid downhole based on the
9 measured ~~resonator~~ response.

10

- 1 12. (previously presented)The method of claim 11, further comprising:
2 estimating the fluid property using a chemometric equation.
3
- 1 13. canceled
2
- 1 14. (currently amended) The method of ~~claim 11~~ claim 12, further comprising:
2 ~~deriving a chemometric equation from measured resonator response correlated~~
3 correlating the response with known fluid property values.
4
- 1 15. (previously presented)The method of claim 11, wherein the property is viscosity.
2
- 1 16. (previously presented)The method of claim 11, wherein the property is density.
2
- 1 17. (previously presented)The method of claim 11, wherein the property is dielectric
2 constant.
3
- 1 18. (previously presented)The method of claim 11, wherein the property is resistivity
2
- 1 19. (previously presented)The method of claim 12, further comprising:
2 applying the chemometric estimated parameter value to a Levenberg-Marquardt
3 (LM) algorithm to determine a fluid parameter value for the fluid.
4

1 20. (previously presented) The method of claim 19, wherein the fluid parameter value
2 comprises a global minimum for the LM algorithm.
3

1 21-30 (cancelled)
2

1 31. (currently amended) A system for determining the properties of a downhole fluid,
2 the system comprising:

3 (a) a surface controller ~~which~~ that lowers a tool deployed in a well bore
4 formed in an adjacent formation, the tool interacting with a down hole
5 fluid;

6 (b) a resonator ~~asseeiated~~ in contact with the ~~down-whole~~ downhole fluid;

7 (c) a controller ~~for actuating~~ that actuates the resonator; and

8 (d) a processor ~~which~~ that estimates a value of a property for the ~~down-hole~~
9 downhole fluid using a response of the resonator.
10

1 32. (previously presented) The system of claim 3,:

2 wherein the processor uses a chemometric equation for estimating a fluid
3 the property value.
4

1 33. (previously presented) The system of claim 32, wherein the processor applies a
2 function applying the resonator response to a the chemometric equation to
3 determine a the fluid property value.
4

1 34. (previously presented) The system of claim 31, wherein the processor uses a
2 function for deriving a chemometric equation from measured resonator response
3 correlated with known fluid property values.
4

1 35. (previously presented) The system of claim 31, wherein the parameter
2 value property is viscosity.
3

1 36. (previously presented) The system of claim 31, wherein the parameter value
2 property is density.
3

1 37. (previously presented) The system of claim 31, wherein the parameter value
2 property is dielectric constant.
3

1 38. (previously presented) The system of claim 31, wherein the parameter
2 value property is resistivity.
3

1 39. (previously presented) The system of claim 12, wherein the processor applies the
2 chemometric estimated parameter value property to a Levenberg-Marquardt (LM)
3 algorithm to determine a fluid parameter value for the fluid.
4

1 40. (previously presented) The system of claim 39, wherein the fluid parameter value
2 comprises a global minimum for the LM algorithm.
3

1 41. (previously presented) The apparatus of claim 1 wherein the resonator comprises a
2 mechanical resonator.

3

1 42. (previously presented) The apparatus of claim 1 wherein the resonator comprises a
2 tuning fork.